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Smoking and Smokeless Tobacco Use Among Adolescents: Trends and Intervention Results

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Synopsis.....

Data from a 2-year study describe tobacco use trends, perceptions, and prevention effects for 1,281 5th and 6th graders enrolled in 12 randomly selected Washington State elementary schools. Youths were pretested, then randomly divided by school into skills, discussion, and control groups.

Preventive intervention curriculums for the skills and discussion groups included age-relevant information on smoked and smokeless tobacco use, peer testimonials, debates, games, and homework. Youths in the skills group also learned communication and problem-solving methods for handling difficult situations around tobacco use. Following intervention, youths were posttested, then retested semiannually for 2 years.

During the 2-year study, three-quarters of all smokers and nonusers and half of all smokeless tobacco users maintained their statuses. Only 10 percent of all smokers and 3 percent of all smokeless users quit their habits. One in six reported new tobacco use, one-third of smokers began using smokeless tobacco, and two-thirds of all smokeless users began smoking during the study. Most youths at final measurement perceived smokeless tobacco as less of a health risk than smoking. Nearly one in two of all smokeless users intended to smoke, and two-thirds were actually smoking at 24-month followup. Both smoked and smokeless tobacco use rates increased in all groups, and youths in the skills intervention group consistently showed the lowest rates relative to the other groups. These findings demonstrate the potential of skills intervention methods for lowering tobacco use rates among adolescents.

'The skills and discussion group curriculums included tobacco use information, peer testimonials, debates, games, and homework; the skills group also learned communications and problem-solving skills for coping with peer pressures to use tobacco.'

THE SURGEON GENERAL WROTE IN THE 1984 report on smoking and health that

"This Report supports my judgment and the judgment of five preceding Surgeons General that cigarette smoking is the chief, single avoidable cause of death in our society and the most important health issue of our time" (1).

Not only do cigarette smokers face increased morbidity and mortality, but also their children may suffer growth retardation, respiratory problems, and cancer (2-5).

Snuff, leaf, and other smokeless products are increasingly popular (6-8). Although the dangers of smokeless tobacco are not nearly as widely perceived by users as they are with smoking, smokeless tobacco does pose health risks. Regular use of smokeless products may lead to periodontal destruction, soft tissue dysplasias, and verrucous and squamous cell carcinomas (9-14). Use of smokeless tobacco is also implicated in the development of hypertension and laryngeal and esophageal carcinomas (15, 16). Younger age markets and trends away from cigarettes may signal an increase in the use of smokeless tobacco in the future (17,18).

Any form of tobacco is addictive (19). Because first tobacco use often occurs in adolescence, the habit can be acquired early. Quitting later can be difficult. Noting tobacco-related mortality rates, Pollin wrote "We can conservatively estimate that more than 60 percent of these yearly deaths do not result from ignorance or from a freely chosen risk . . . but instead represent persons who became addicted to nicotine as adolescents" (20). Nearly all tobacco users try to quit; many succeed. Informal efforts still comprise the bulk of cessation successes (21).

Most cessation attempts fail, initially and repeatedly. In fact relapse rates for tobacco use are

higher than for any other substance (22,23). Thus, Cullen proposed "If resources are limited, and they appear to be, the emphasis ought to be placed on smoking prevention and not on smoking cessation" (24).

Our paper adds to public health knowledge on the nature and prevention of tobacco use by reporting data from a 2-year study performed in 1983-85 of smoking and use of smokeless tobacco by fifth and sixth grade students. The paper suggests trends and explanations for smoking and smokeless tobacco use as well as the results of intervention.

Methods

Subjects. The study comprised 1,281 informed and consenting 5th and 6th graders from western Washington State schools. Schools in the sample were similar in the socioeconomic descriptors of students' parents, student body size, and ethnic-racial distributions. The sample at the beginning of the study had a mean age of 11.2 years and was 48 percent female and 13 percent nonwhite. We used ZIP Code and census tract data as indicators of mean family income and occupation. Adult members of youths' households were occupationally distributed as follows: 9 percent, professional-managerial; 69 percent, skilled-technical; and 22 percent, semiskilled-laborer.

Procedure. Youths were pretested and randomly divided by school into skills, discussion, and control groups. The skills and discussion group curriculums included tobacco use information, peer testimonials, debates, games, and homework; the skills group also learned communications and problem-solving skills for coping with peer pressures to use tobacco.

Afterwards, all youths were tested again and then retested semiannually for 2 years. In every test, the youths completed measures of tobacco use perceptions, gave 1-milliliter saliva samples, and reported their smoked and smokeless tobacco use (25-27). To increase reporting accuracy, the saliva samples were taken after the youths learned how smoking is measured in the laboratory and before they reported their recent tobacco use (28).

Intervention. Curriculums for the skills and discussion groups were given in eight 50-minute sessions. Through films and guest speakers, the students were presented information appropriate for their ages on smoking and use of smokeless tobacco.

Peer testimonials by older youths noted practical alternatives to tobacco use. In debates, students weighed the health, life style, and economic effects of tobacco use. In games that focused on the negative aspects of tobacco use, youths participated in parodies of television quiz shows and in skits on tobacco industry advertisements. Homework was assigned at the end of each session, with reports on completed homework beginning the next session.

Students in the skills group also learned methods to help them deal with peer pressures to use tobacco. Using self-statement methods, youths learned to respond adaptively during difficult situations. Illustrative are these subvocal self-statements: "Gee, all the guys are lighting up. What'll I do if they want me to smoke? I know, I'll say, 'No, I don't like to smoke.' If they hassle me, I'll split."

Problem-solving methods enabled youths in the skills group to identify peer pressure and personal temptation to use tobacco, to generate solutions for such problems, and to choose the best solution from those generated. Finally, the communications skills taught helped youths offset negative peer pressure. Youths practiced refusing invitations to use tobacco and giving one another appropriate praise and coaching.

Analysis. By univariate analyses, observational data from intervention sessions did not differ between groups for student attention, involvement, or participation. Comparisons between written protocols and actual intervention indicated close agreement for both intervention groups. (29).

Analyzed by multivariate and step-down univariate procedures, student demographic and pretest data did not differ across schools or groups. At the final followup, student dropout rates averaged 10.8 percent, with no group differences. Randomly, 25 percent of saliva samples were tested for thiocyanate, a biochemical indicator of inhaled tobacco smoke. Across measurements and groups, thiocyanate levels measured in micrograms per milliliter were correlated with reported tobacco use ($r = .37, P < .001$). Thiocyanate and self-reported correlations were relatively strong for youths with regular or no tobacco use (mean $r = .46, P < .0001$) and were relatively weak for youths with sporadic or extreme use rates (mean $r = .11, P < .01$). These variations aside, distributions of thiocyanate and self-reported r values revealed no significant underreporting or overreporting. Consequently, youths'

Table 1. Percentages of youth reporting tobacco use at 24 months by pretest status

Pretest status	24-month status		
	Smoker	Smokeless user	Nonuser
Smoker.....	73	33	10
Smokeless user..	67	54	3
Nonuser.....	14	16	77

NOTE: Row percentages exceed 100 because youths who reported smoking and smokeless use appear in both categories.

tobacco use reports were used as dependent variables (30,31).

For analytic purposes, the index of self-reported tobacco use was calculated as follows. Tobacco use was defined as a report of smoking or using smokeless tobacco in the previous 7 days. In addition to cigarettes, smokers used cigars, pipes, little cigars, clove cigarettes, and specialty items. Smokeless tobacco products included snuff, leaf, plug, roll, twist, dry and moist snuff packets, and specialty items.

Youths reporting that they both used smokeless tobacco and smoked were scored as doing both for several reasons. Because the study was designed to examine trends in tobacco use patterns over time, we were equally interested in all tobacco use behavior—smoking, use of smokeless tobacco, both, and neither. Furthermore, decisions to categorize youths as exclusively smokers or users of smokeless tobacco when they used both products would have been arbitrary. Such arbitrary decisions would have jeopardized the integrity of the data. To fairly represent tobacco use at each measurement, we scored youths who reported both using smokeless tobacco and smoking as doing both.

Results

Trends. Tobacco use trends were found by comparing pretest and 24-month data. Across groups, the results showed that about three-quarters of all smokers and nonusers maintained their respective statuses (table 1). Of the students who reported smoking at pretest, 33 percent reported using smokeless tobacco at the 24-month followup. Of those who reported at pretest using smokeless tobacco, 67 percent reported smoking at the 24-month followup. Regardless of their pretest status, youths were more apt to start or continue using tobacco than to quit using it. Because of the students' relatively young ages at pretest and their

Table 2. Percentages of youths who agreed with tobacco use facts and risks and their intentions at 24-month followup

Questionnaire item	Tobacco use		
	Smoker	Smokeless user	Nonuser
Smoking hurts your health.....	81	86	95
If I smoke I'll hurt my health.....	63	81	92
I'll smoke when I'm in high school.....	66	48	11
Snuff and chewing tobacco hurt your health.....	41	33	59
If I use snuff or chewing tobacco I'll hurt my health.....	31	22	67
I'll use snuff or chewing tobacco when I'm in high school.....	18	59	15

relatively low tobacco use rates at that time, the percentages in table 1 are based on admittedly small numbers.

Perceptions. In the analysis, we next examined the youths' perceptions of tobacco use. When tobacco use status is analyzed at final measurement across groups, most of the youths perceived smoking as being unhealthy and risky (table 2). Only nonusers more often than not viewed smokeless tobacco use as harmful. Relative to nonusers, smokers and smokeless tobacco users were not inclined to see the products they used as harmful. Nearly one of every two smokeless tobacco users intended to smoke in high school, and about one in five smokers intended to use smokeless tobacco at that time.

Intervention effects. After analyses of covariance on tobacco use rates, intervention effects were tested with Duncan multiple-range comparisons. Over time, smoking and smokeless tobacco use rates increased in all groups (table 3). Rates in the skills groups were below the grand mean after the posttest and remained below it through the 24-month followup. Of seven comparisons in the table, two favored the skills and control groups, and five favored the skills group. Thus, youths in the skills intervention group showed lower rates of smoking at 6-, 12-, 18-, and 24-month followups relative to youths in other groups.

Compared with youths in the discussion and control groups, youths in the skills intervention group showed a lower rate of smokeless tobacco use at the 24-month followup. At the 12-month

followup, youths in the skills intervention and control groups had lower smokeless tobacco use rates compared with youths in the discussion groups.

Discussion

The results suggest trends, explanations, and intervention outcomes for tobacco use among youth. During the 2-year study, three-quarters of all smokers and nonusers and half of all smokeless tobacco users continued their habits. Only 10 percent of all smokers and 3 percent of all smokeless users quit their habits. One in six youths reported new tobacco use; one-third of smokers began using smokeless tobacco, and two-thirds of all smokeless tobacco users began smoking during the study. These trends are partly explained by perceptions of tobacco use. Whereas nonusers held the most negative perceptions of tobacco, users of any tobacco product were less negative, and users of the index product—smoked or smokeless tobacco—were the least negative.

Personal habits aside, youths were one-half as likely to regard smokeless tobacco use as harmful as they did smoking. Just one in three users of smokeless tobacco perceived it as unhealthy; one in five saw the habit as personally risky. Future intentions about tobacco use were also informative (table 2). For nonusers, future intentions closely matched present use. But for smokers and smokeless tobacco users, future intentions were lower than present use rates. The greatest discrepancy was between smokeless tobacco users' intentions and their later smoking behavior. One in two of these youths at pretest intended to smoke in high school, yet two in three reported smoking only 24 months later.

Intervention outcome data complete the findings. Across the groups, semiannual measurements showed rising tobacco use. A smaller increase was reported in the skills group than in the discussion and control groups. Biochemical sampling to enhance the youths' reporting accuracy strengthened these results. Unremarkable outcomes for youths in the discussion group, moreover, indicate that skills group outcomes were not due to placebo effects (32). The duration of lower tobacco use in the skills group gives credence to these youths' maintenance of learning.

The study's findings allow speculation on tobacco use among youth. Particularly interesting were youths' perceptions and use of smoked and smokeless products. Most youths saw smokeless

Table 3. Percentages of adolescents who reported smoking and using smokeless tobacco, by intervention group and test over 2 years

Intervention group	Smokers						Smokeless tobacco users					
	Pre-test	Post-test	Followup (months)				Pre-test	Post-test	Followup (months)			
			6	12	18	24			6	12	18	24
Skills.....	4	4	¹ 5	¹ 6	¹ 8	¹ 7	³	⁴	¹ 6	¹ 8	¹ 0	¹ 12
Discussion.....	3	4	⁶	² 8	² 10	² 11	³	⁴	² 9	² 10	¹ 2	² 16
Control.....	4	5	² 7	² 9	² 11	² 12	²	³	¹ 6	¹ 8	¹ 1	² 15
Grand mean ...	4	4	⁶	⁸	¹⁰	¹⁰	³	⁴	⁷	⁹	¹¹	¹⁴

NOTE: Column means with dissimilar superscripts differ at $P < .05$ by Duncan multiple-range comparisons; means without subscripts do not differ from other

column means.

tobacco use as rather benign, not as unhealthy or risky. Without proving causality, these perceptions shed light on the youths' tobacco use trends. The present data show that during the 24-month study two-thirds of all smokeless tobacco users progressed to tobacco smoking. Relative to smoking, smokeless tobacco use rates rose more quickly and reached higher levels across groups. These data may be better understood in the context of the youths' development over the study period.

During the study, youths moved from childhood to adolescence. Early adolescents are wont to express new identities, often symbolically by such gestures as smoking (33-35). In middle adolescence, youths experiment with substances not only for identity effects, but also for psychoactive effects. The use of smokeless tobacco brings both kinds of effects (12,36). With finesse, smokeless tobacco lends itself to surreptitious use in school and in other supervised settings. But this finesse takes coordination and practice that may not come until middle adolescence (37-39). Youths in their late adolescence—who are concerned with appearance, want to interest dating partners, and have little supervision—may choose to smoke rather than use smokeless tobacco.

Our study findings must be tempered with caution. The sample was not large and may not reflect national populations. In addition, norms among some groups, for example, western Washington forestry workers, may promote use of smokeless products over smoking for safety and convenience reasons. Also, some youths were students who are permitted to use tobacco at school (40).

Summary and Research Needs

Smokeless tobacco use increased among all groups of early adolescents during the study and

appeared to lead to smoking in high school; two-thirds of the smokeless tobacco users at the beginning of the study were smoking at the 24-month followup. The study data show that smokers, users of smokeless tobacco, and nonusers all perceived smokeless tobacco as less of a health risk than cigarette smoking. In addition, the skills intervention group, which was informed of the health risks and taught problem-solving and communication skills for coping with peer pressure, showed that these techniques have the potential for lowering tobacco use rates among adolescents.

Descriptive, survey, and intervention studies will improve public health knowledge of this difficult habit. Studies are needed on the interaction of smoked and smokeless tobacco use; they could investigate the beginning and maintenance of tobacco use and focus on high-risk populations (41-44). At a time of unprecedented interest in smoking prevention and cessation, careful studies on smokeless tobacco use are fitting (45-47). Perhaps the present data will encourage creative research on tobacco use among youth.

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